

Session 7.0

CL Success Story



Launch Failures that Initiated the President's Broad Area Review

Multiple failures across different launch vehicles and contractors

<u>Vehicle</u>	<u>Launch</u>	<u>Spacecraft</u>	<u>Failure Mode</u>
Titan IVA-20	12 Aug 98	NRO	Electrical cable short
Delta III	26 Aug 98	Galaxy 10	Vehicle roll stability
Titan IVB-27/IUS-21	9 Apr 99	DSP-19	IUS Stage separation
Athena II	27 Apr 99	IKONOS	Fairing failure to sep
Titan IVB-32/Centaur-14	30 Apr 99	MILSTAR-3	Centaur guidance s/w
Delta III	4 May 99	ORION-III	RL10-B2 engine

No common hardware or software failures/causes among incidents

Each individual incident considered a small error or oversight that led to total loss of mission

Cost of these failures to various users/customers: over \$3 billion!



Key BAR Observations—Heritage Programs

- **Approximately \$20B in assets were at risk on Titan, Atlas and Delta fly-out missions—including critical systems with no spares**
- **Titan and Inertial Upper Stage (IUS) programs exhibited a premature “going out of business” mindset**
- **Approach to fly-out systems influenced by EELV anticipation**
- **System design and process engineering deficiencies played a prominent role in failures and near misses—program management**
- **Clear authority and accountability for delivering DoD spacecraft on orbit were (and still are) key to increased mission success**
- **Maintaining engineering and technical support expertise was (and still is) critical to mission success for these programs**
- **Given the historical record, satellite constellation planning and budgeting based on 100% launch success was (and still is) unrealistic**



Launch BAR Bottom Lines

- **Government ensure industry acts to correct causes of recent failures and improve systems engineering and process discipline**
- **Government establish clear accountability for mission success for fly-out systems and transition to EELV**
- **Enhance Government industry partnership with needed management, engineering support and emphasis on mission success**
- **Provide a well-defined, coordinated, disseminated transition plan to EELV**
- **Government invest to build confidence in EELV reliability with enhancements and increased oversight**



Where Heritage Programs Are Today

- **Fully recovered from severe launch mishaps—rediscovered many lessons**
 - Had lost crucial focus on quality and mission success—responsibilities were unclear
 - Critical program office technical expertise was decayed by cost savings/downsizing
- **Implemented over 100 corrective actions from mishap boards and Broad Area Review**
- **Moved acquisition chain of command from Pentagon to SMC**
- **Reinvigorated significant mission assurance initiatives by the Aerospace Corporation**
- **Teamed with AFSPC to give SMC cradle-to-grave responsibility for flight worthiness**
- **SMC Commander now appoints Mission Director on all AF COCOM missions**
- **Initiated Operational Safety, Suitability, and Effectiveness Plan—added Chief Engineer**
- **Enforced “test like you fly” and “clean vehicle shipment” policies to enhance quality**
- **Implemented contractor employee retention/critical skills through fly-out**
- **Reinitiated use of Independent Readiness Review Teams/Mission Assurance Teams**
- **Achieved 22 mission successes (100%) with new SMC/CC Flight Readiness Review**



Heritage Mission Successes

- 22 May 99 Titan IVB-12 NRO (first ever Titan IVB from Vandenberg AFB)
- 20 Jun 99 Titan IIG-7 NASA QuikSCAT
- 07 Oct 99 Delta II GPS 2R-3 (first Delta GPS launch since 5 Nov 97)
- 12 Dec 99 Titan IIG-8 DMSP F-15 (first Titan DMSP launch since 04 Apr 97)
- 21 Jan 00 Atlas IIA/MLV-8 DSCS (first Atlas DSCS launch since 24 Oct 97)
- 08 May 00 Titan IVB-29 IUS DSP-20 (first time for SMC Mission Director)
- 10 May 00 Delta II GPS 2R-4 (SMC Mission Director)
- 16 Jul 00 Delta II GPS 2R-5 (SMC Mission Director)
- 17 Aug 00 Titan IVB-28 NRO
- 21 Sep 00 Titan IIG-13 NOAA-L
- 19 Oct 00 Atlas IIA/MLV-9 DSCS (SMC Mission Director)
- 10 Nov 00 Delta II GPS 2R-6 (SMC Mission Director)
- 05 Dec 00 Atlas IIA/MLV-11 NRO
- 30 Jan 01 Delta II GPS 2R-7 (SMC Mission Director)
- 27 Feb 01 Titan IVB-41 MILSTAR-4 (SMC Mission Director)
- 18 May 01 Delta II GeoLITE NRO (first NRO Delta II launch)
- 06 Aug 01 Titan IVB-31 IUS DSP-21 (SMC Mission Director)
- 08 Sep 01 Atlas IIA/MLV-10 NRO (first DoD Atlas IIA from Vandenberg AFB)
- 05 Oct 01 Titan IVB-34 NRO
- 10 Oct 01 Atlas IIA/MLV-12 NRO
- 15 Jan 02 Titan IVB-38 MILSTAR-5 (SMC Mission Director)
- 24 Jun 02 Titan IIG-14 NOAA-M



Heritage Launch Best Practices

- **Mission Success is the #1 priority**
- **Take good care of people—they are crucial to mission success**
- **Treat all spacecraft as precious nationally-critical assets**
- **Provide clear accountability and responsibility—minimize unnecessary bureaucracy, interfaces, and contracts**
- **Create environment conducive to problem identification and solving**
- **Encourage synergy and shared lessons learned across programs**
- **Hire the best hands-on, space systems smart, hardware/software experts in the Air Force to serve as Program Managers (PMs)**
- **Empower Aerospace experts as full partners on Government team**
- **Respect mission success insights/concerns by AF and Aerospace**
- **Empower Detachments to orchestrate all launch site activities for PM/SPD**
- **Involve IRRT/MAT up-front & early—address concerns promptly**
- **Empower launch vehicle contractors as full team partners—trust them to do their job (but verify critical processes)**
- **Ensure contractor incentives clearly aligned with mission success**

